

APPROVAL SHEET FOR SUSPENDED LOAD OPERATIONS

SLO-KSC-1996-008, CHANGE 1

TITLE Mate Spacecraft to Delta Third Stage

DOCUMENT NUMBER/TITLE LPD 6208, Spacecraft Processing

PREPARED BY Malcolm Glenn

DATE 11/18/00

REQUIRED APPROVAL

CONTRACTOR	<input type="checkbox"/> DESIGN	<input type="checkbox"/> R & QA	<input type="checkbox"/> OPERATIONS	<input type="checkbox"/> SAFETY
NASA	<input type="checkbox"/> DESIGN	<input type="checkbox"/> R & QA	<input type="checkbox"/> OPERATIONS	<input type="checkbox"/> SAFETY

TYPE OR PRINT NAME	SIGNATURE	ORGN.	DATE
<u>COMMENT</u>			
I, Malcolm Glenn, take responsibility for signature/approval authority for this change to SLO-KSC-1996-008. This change added the last sentence to Alternate Standard Requirement #1a. Also, Alternate Standard Requirement numbers 2, 3, 4, 5, 14 and 15 were added.			
Malcolm Glenn	Malcolm Glenn	PH-P1	11/18/00

CONTRACTOR DIRECTOR OF SAFETY

NASA SUSPENDED LOAD OPERATION ANALYSIS/APPROVAL

NUMBER: SLO-KSC-1996-008
CHANGE 1, NOVEMBER 2000
PAGE: 1 OF 3

OPERATION: Mate spacecraft to Delta third stage.

SUPPORTING DOCUMENTS: The associated System Assurance Analyses (SAA) and test procedures are as follows:

SAA 01FS0420-001 - 20-ton Bridge Crane SAEF 2
SAA 01HS11-005 - 50-ton Bridge Crane PHSF
Launch Preparation Document - LPD G208, Spacecraft Processing

GENERAL DESCRIPTION: The following operation requires personnel to work under a suspended load:

Mate spacecraft; e.g., Mars Global Surveyor, Mars Pathfinder and potential future missions, to Delta third stage.

This operation requires 4 personnel to work below the spacecraft when suspended from the overhead bridge crane in SAEF 2 or the PHSF to guide the spacecraft on to the Delta third stage. The test procedures will include warnings and precautions to minimize the exposure of personnel to suspended loads.

RATIONALE/ANALYSIS: This suspended load operation complies with the NASA Alternate Safety Standard for Suspended Load Operations as follows:

Alternate Standard Requirement #1a: The spacecraft mating/separation ring is smaller in diameter than the outer diameter of the spacecraft. It is necessary to position personnel beneath the spacecraft to ensure proper mating and prevent damage to the flight separation interface. Personnel will also perform final cleaning of the spacecraft mating surface and inspection while under the suspended load.

Alternate Standard Requirement #1b: The possible use of a secondary support system was analyzed and determined not feasible because the separation interface represents the only primary structure support for the spacecraft.

Alternate Standard Requirement #1c: Test procedures will limit the number of personnel beneath the suspended load to no more than 4.

Alternate Standard Requirement #1d: Personnel will perform the spacecraft mate to the Delta third stage as quickly and safely as possible to minimize exposure. The suspended load operation is estimated to take approximately 30 minutes.

NASA SUSPENDED LOAD OPERATION ANALYSIS/APPROVAL

NUMBER: SLO-KSC-1996-008
CHANGE 1, NOVEMBER 2000
PAGE: 2 OF 3

Alternate Standard Requirement #2: Suspended load operations are reviewed and approved on a case-by-case/specific need basis - see General Description and Alternate Standard Requirement #1.

Alternate Standard Requirement #3: Only those suspended load operations approved by the NASA Safety and Mission Assurance Division Chief will be permitted. A list of approved suspended load operations will be maintained by the NASA Safety and Mission Assurance Division.

Alternate Standard Requirement #4: Operational requirements will be included in test procedures which will be on-site for inspection.

Alternate Standard Requirement #5: A new suspended load operation not covered by this SLOAA, deemed necessary due to unusual or unforeseen circumstances where real time action is required, shall be documented and approved by the NASA Safety and Mission Assurance Division Chief.

Alternate Standard Requirement #6: The suspended load operations covered by this report are performed at SAEF 2 using the 20-ton bridge crane or at the PHSF using the 50-ton bridge crane. The cranes are designed, tested, inspected, maintained and operated in accordance with the NASA Safety Standard for Lifting Devices and Equipment, NSS/GO-1740.9.

The crane are load tested annually at 100% of rated capacity and there is a preventive maintenance program to ensure proper operation. All aspects of the crane controls are verified before each use and load holding/brake capability is tested annually.

The spacecraft lift fixtures meet a design safety factor of five times ultimate strength.

Operation of the crane will be by trained and certified operators per KMI 6730.3, Examination and Licensing of KSC Special and Heavy Equipment or Facility Cranes/Hoists Operators.

An individual will be stationed at the crane main circuit breaker during hoisting to immediately remove power, thus setting the brakes, should a failure occur with the crane controls.

Alternate Standard Requirement #7: SAAs have completed on the SAEF 2 20-ton bridge crane and the PHSF 50-ton bridge crane. The SAA includes a Failure Modes and Effects Analysis/Critical Item List (FMEA/CIL) and a Hazard Analysis (see supporting documents).

**NASA SUSPENDED LOAD OPERATION
ANALYSIS/APPROVAL**

NUMBER: SLO-KSC-1996-008
CHANGE 1, NOVEMBER 2000
PAGE: 3 OF 3

The SAA (SAA 01FS0420-01) for the SAEF 2 20-ton bridge crane and the SAA (SAA 01HS11-005) for the PHSF 50-ton bridge crane identify no Category 1 Mechanical or Electrical Critical Items.

Alternate Standard Requirement #8: Visual inspections of the lifting equipment as well as crane functional checks **will** be performed prior to each use.

Alternate Standard Requirement #9: Trained and certified operators shall man the crane controls at all times when personnel are beneath the suspended load.

Alternate Standard Requirement #10: Appropriate safety control areas are established before initiating operations. Only the minimum number of personnel will be permitted in this area.

Alternate Standard Requirement #11: A pretask briefing and a safety walkdown of the area are conducted prior to the lift to ensure all systems and personnel are ready to support.

Alternate Standard Requirement #12: Personnel beneath the suspended load **will** be in voice contact with the crane operator and task leader throughout the operation. At any time during the operation anyone can call a safety hold if they see a discrepancy. The crane operator will have full visual contact with the load throughout the operation.

Alternate Standard Requirement #13: The task leader and crane operator will be in visual contact with personnel beneath the suspended load throughout the operation.

Alternate Standard Requirement #14: The NASA Safety and Mission Assurance Division shall conduct periodic reviews to ensure the continued safety of suspended load procedures.

Alternate Standard Requirement #15: The NASA Safety and Mission Assurance Division shall provide copies of approved SLOAAs, a list of approved suspended load operations, a list of cranes/hoists used for suspended load operations and copies of the associated FMEA/CIL and hazards analyses to NASA Headquarters.

Approval:

Date:

Malcolm Glenn 11/18/00

Malcolm Glenn

NASA Safety and Mission Assurance Division
Kennedy Space Center